Field Evaluation of Porous Asphalt Pavements

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Credits

- Project initiated by Heritage Research Group
- Approved by INDOT, FHWA
- Funded jointly by the Institute for Safe, Quiet and Durable Highways, INDOT, Milestone Contractors and HRG
- Conducted by NCSC, SQDH and HRG

The Project

- I74 Eastbound East of I465
  - Test Section located between Mount Comfort and Acton Road Interchanges
- Constructed August 2003
- Steel Slag SMA and Steel Slag PFC
  - PFC = Porous Friction Course
- Conventional HMA Section on US52, West Lafayette, constructed July 2003

Porous Friction Course

- PFC is similar to Georgia's Porous European Mix (PEM)
- Interconnected voids
  - High permeability provides drainage and prevents clogging
- Increased friction, especially wet
- Reduced noise
- Improved wet weather visibility

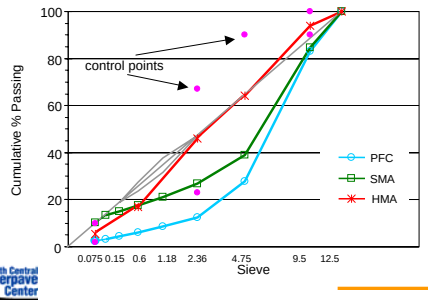
Goal of Field Trial

- Evaluate use of PFC in Indiana
  - Need strong, durable aggregates
- Effects of PFC on friction, noise, splash and spray, pavement performance
  - Follow-up study to evaluate long-term durability and performance
- Comparison of PFC, SMA, Conventional HMA

The Materials

- 9.5mm mixtures used steel slag and PG76-22 binder
- PFC designed at 18-22% air voids
  - Old OGFC designed at 12-15% voids
  - Polymer modified binder and fiber
- SMA has fairly open aggregate structure, but voids are largely filled with matrix of binder and filler (fiber)

Design Gradations



Local Challenge

- Georgia practice with PEM results in 19-25mm drop-off
  - Unacceptable in Indiana
- Use smaller nominal max size
  - 9.5 vs. 12.5mm mix
- Use thinner lift
  - 30mm vs. 40mm
- Taper lift thickness to 15mm at edge

Construction

SMA vs. PFC

Conventional HMA

Performance

- Friction and Surface Texture
- Noise Measurements
- Splash and Spray

Dynamic Friction Tester

Circular Texture Meter

DFT and CTM

- DFT readings influenced by both micro- and macrotexture
- CTM measures macrotexture
- DFT and CTM used together to determine International Friction Index
  - Correlates well with other standard devices

Field Data Comparison

Surface	DFT 20	CTM	F60
Porous	0.51	1.37	0.36
SMA	0.37	1.17	0.28
HMA	0.52	0.30	0.19

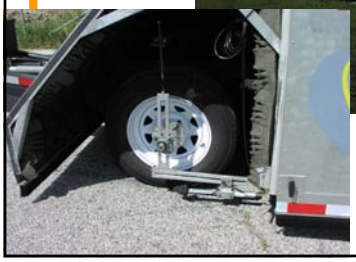
Porous and SMA tested before trafficking.

Noise Measurements

- Sideline (Pass-By) Noise Measurements
- Close Proximity Trailer Measurements
- Remember, decibel readings are on logarithmic scale and readings are taken in different locations

Sideline Noise Measurements

Close Proximity Trailer



Sideline Noise Data

At 80 kph (50 mph)

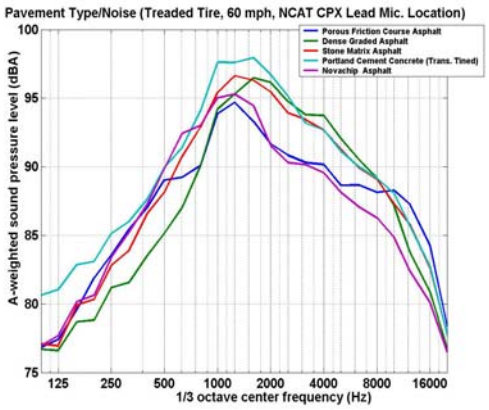
Vehicle	HMA	SMA	PFC
Impala	72.6	74.8	68.1
Volvo	75.2	75.5	70.1
Silverado	74.5	77.0	71.6

CPX Data (dBA)

Speed	HMA	SMA	PFC
72 kph	93.0	94.2	89.7
97 kph	96.4	97.6	92.6

Comparison of Noise Levels

Surface	Sideline	CPX
PFC	0	0
HMA	2.1 dB higher	3.6 dB higher
SMA	5.9 dB higher	4.8 dB higher



Preliminary Findings

- PFC significantly quieter than SMA or conventional HMA
- In car noise significantly different and lower on PFC

Splash and Spray

- Video by Wayne Jones, Asphalt Institute

Preliminary Findings

- PFC provides higher macrotexture than SMA and much higher than HMA
- Friction levels are currently higher for PFC and SMA than HMA
  - Will traffic wear off film and increase IFI?
  - Will PFC lose macrotexture and friction?

Preliminary Findings

- PFC surface provided significantly lower noise levels than SMA or HMA
  - Somewhat surprisingly, SMA was louder than HMA
- Sideline and CPX measurements ranked the pavements in the same order
- Splash and spray significantly reduced with PFC

Long Term Performance

- Question remains how long these effects will persist.
  - Does the PFC clog and lose effectiveness?
  - High permeability is supposed to help prevent that, but ….
- Long term monitoring of the test section has been suggested and appears likely to be funded.
- PFC appears to hold promise for safety and comfort.